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ABSTRACT

This final report describes activities and accomplishments of a 3-year, federally supported project at the University of Massachusetts (Lowell) to develop a 4-year general education core program featuring both curriculum coherence and choices in courses for students. The curriculum was developed by faculty working in small interdisciplinary (cluster) groups. The cluster groups created five to nine courses in the humanities and social sciences to be offered to junior engineering majors. Four more liberal arts clusters and three science clusters for liberal and fine arts students were also nearing implementation. Evaluation indicated the project was a highly successful tool for faculty development and curriculum design, but that clusters were too small and should probably involve 8 to 10 faculty and as many as 10 to 12 courses. Student evaluations indicated satisfaction with clusters. (DB)

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COVER SHEET

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University of Massachusetts Lowell (formerly U. Lowell)
College of Arts and Sciences
1 University Avenue
Lowell, MA 01854

Grant Number

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EXECUTIVE SUMMARY

CORE Cluster Implementation Project
University of Massachusetts Lowell
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A. PROJECT OVERVIEW

This *CORE cluster implementation project* began in September 1990 as an attempt to find a way to put into operation a distinctive four year general education program that featured both coherence in the curriculum and choices in courses for the student. It also provided for the faculty involved a means to cross disciplinary lines and work in small groups (cluster groups) to create the curriculum. It was not a grant for course construction and so had no provisions for the customary troupe of outside experts visiting in summer workshops to instruct the faculty. The cluster groups (subsidized by FIPSE at the rate of $30 an hour for ten hours a semester) in fact did create miniature CORES of five to nine courses in the humanities and social sciences for offering in the second year of the grant to junior engineering majors. They were to choose three courses from one cluster to be taken in their last four semesters. In that same year four other clusters formed, creating a total of eight. The plan envisaged expanding the audience for the clusters to other professional-college majors in the Fall of 1994. As a result in the last year of the grant, four more liberal arts clusters evolved. A parallel development of science clusters for liberal and fine arts students began in 1993. Three of these were in place by the Spring of 1994. In theory, then, all the undergraduates on campus would be served.

B. PURPOSE

Both professional and non-professional undergraduate curricula can include breadth and depth in general education courses if that part of a student's program is organized into lower and upper divisions distributed over four years. Then during the last two years, small clusters of upper level courses built around agreed-upon themes and requirements can offer students some elective choice while providing coherence among the courses. By involving them in the planning, construction, implementation and governance of the clusters, faculty will be engaged in the curriculum instead of being only employed in it.

For any new general education reform to succeed, faculty have to be induced to commit themselves to the goal that general education will become as important as any other part of the curriculum. Participating, individual faculty members had to construct the new general education curriculum in order for it to succeed. They had to provide the guiding philosophy for a true CORE. The mechanism chosen to transfer responsibility for these tasks from the usual oversight committee to faculty participating in the new CORE was the cluster-group, which was modeled loosely on small development teams used in industry.

C. BACKGROUND AND ORIGINS

The University of Massachusetts Lowell is a technologically oriented multi-purpose university that was created by the merger in 1975 of a State College and a Technological Institution with two main campuses a mile apart. (Lowell was absorbed into an enlarged University of Massachusetts system in 1991). The campus special mission is focused on aid to local (i.e. regional) industry.

In the mid-eighties the campus restructured its CORE to reach over all four years of a student's career bringing engineers and scientists into upper level liberal arts courses and

students in non-professional programs into sophisticated science courses in their junior and senior years. Campus planners did not expect transfer students to be a large part of the student body.

When the *Accrediting Board of Technology and Engineering* (hereafter ABET) demanded in its 1986-87 standards breadth and depth in the humanities and social sciences, Lowell's four year CORE seemed to fit this accreditation requirement. FIPSE gave Lowell a three year grant beginning in 1990 to implement the cluster concept.

Already the depression that followed the stock market crash of 1987 had altered the conditions in which the project was to go forth. State funding declined disastrously; tuition and fees rose in reaction. Suddenly in 1992-93 the campus, thought by its planners to be relatively immune to abnormal fluctuations in student numbers, suffered a sharp decline in enrollment. The number of transfer admissions rose to over 40%. The four year CORE became a recruitment encumbrance. It was abandoned for all students except engineers in May 1994.

D. PROJECT DESCRIPTION

The first four cluster leaders came from faculty with experience running interdisciplinary programs. The remaining four to seven members of each group were recruited for a reputation as good teachers and their interest in the cluster topics. During the first year four cluster-groups met for about ten hours of discussions a semester to plan a small assemblage of upper level courses that cut across disciplines in the social sciences and humanities and revolved around a common theme which the faculty picked. The result was a series of miniature CORES with common course requirements that were tied together by theme, as well as by expectations for student performance and goals.

The cluster-group was to continue to function after the planning stage finished. The coherence of the curriculum is the product of the cluster-group's consensus. Further, by being self-governing the cluster-group could use peer pressure to do better the job of policing the CORE to eliminate "powder puff " courses than could a distant oversight committee.

Since so many disciplines crossed in the clusters, faculty faced the difficult question of prerequisites. If the cluster used three of the minimum six humanities and social sciences courses required in any given professional curriculum, there was no room for a series of introductory prerequisite courses. Students would have to acquire any specialized vocabulary or guiding ideas specific to a discipline in the first few weeks of a cluster course.

Two types of cluster evolved. One, for example, entitled Technology and Human Values, put together a group of courses that focused on the issues of values and choice facing people making decisions in a High-Tech world. A second type, oriented to cultural studies, is represented by the cluster entitled Community and Diversity in America, having its origins in the field of American Studies.

Discussions began with the faculty in the sciences about their clusters in the second year of the grant. From the start there were difficulties. The hierarchical nature of the sciences created in the faculty a mind-set that derived upper level courses from lower level prerequisites. Most of the science faculty thus would see the cluster as a kind of three course miniature minor in a single discipline. To see whether the interdisciplinary cluster idea could apply to sciences, a group of scientists and humanists met for periods during two summers to explore the creation of an *Introduction to Science* course that would be prerequisite to a science cluster. The aim here was to find non-traditional approaches to teaching science to laymen.

EVALUATION / PROJECT RESULTS

Two evaluations during the grant and one after it, all concluded roughly the same thing: the project was a highly successful tool for faculty and curriculum development. The successes listed by the evaluators are real and continuing; they fulfill the original objectives

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of the grant: 1. Expanding the perspectives of students in professional programs; 2. Emphasizing writing; 3. Emphasizing discussion; 4. Making the courses truly upper level (Humanities and Social Sciences); 5. Involving faculty in an enthusiastic way in general education; 6. Meeting the demands of accrediting agencies in a responsible way.

Some of the cluster groups are more vital than others -- meeting regularly as self-regulating units. Where there is lassitude, to an extent this can be traced to the energy and commitment of the cluster leaders. It is they who must schedule the ongoing meetings after the cluster begins functioning. It is they who must take the responsibility to see that student evaluation is ongoing and those sufficient numbers of courses a semester is available each year. These are not paid positions and no course reduction is attached to them. The cluster leader must obtain gratification from the success of the group. There is no authority over the leaders other than peer pressure. The project director's limited power and authority terminated with the grant. In any case the project fails in one of its most important premises, if an administrator has to oversee the groups.

There is question in some evaluators' minds about whether in practice the coherence among the courses in the clusters is always apparent to the students. Some problems have arisen with course availability. While it is in general a faculty resource question, it also is a product of the small size of the cluster groups. There are available solutions for both problems.

F. SUMMARY AND CONCLUSIONS

As a faculty development scheme the project succeeded admirably. Cluster faculty in the Humanities and Social Sciences are deeply connected to the program. The concept of the cluster groups worked well in formulating the questions and the common themes as the faculty organized themselves. The energy and commitment of the cluster leaders often determined the success, coherence and continuation of the group.

Evidence from student evaluations and student interviews indicates a high level of satisfaction with clusters favored by engineering students. Coherence in the curriculum as a goal may need strengthening, but the objectives of improving writing and discussion skills while broadening students' points of view have been met.

Experience seems to be proving that the clusters are too small, perhaps too narrow in their topics. Five or six courses from as many faculty are too few to guarantee enough seats in a given semester to satisfy student demand. Cluster groups should be about eight to ten faculty and perhaps as many as ten to twelve courses, each offered at least once every two years. It is also possible that the wrong students are taking the wrong clusters: *e.g.*, engineers do not get a cultural rounding sitting in classes whose content links too closely with their professional curriculum. There is still debate about this problem of how to humanize professional curricula both at large and on campus.

As to the science education part of this project: it is not clear that what FIPSE wanted -- upper level science courses for non-scientists -- is a practical objective. The cluster courses that resulted, unlike the ones in the Humanities and Social Sciences, are upper level courses only by virtue of a narrowing in most of them of the topic studied and the assignment of a 300 (upper division) number. Given the level of preparation of most students in non-professional programs, particularly in mathematics, true upper level science courses are beyond them.

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BODY OF REPORT

A. PROJECT OVERVIEW

This *CORE cluster implementation project* began in September 1990 as an attempt to find a way to put into operation a distinctive four year general education program that featured both coherence in the curriculum and choices in courses for the student. It also provided for the faculty involved a means to cross disciplinary lines and work in small groups (cluster groups) to create the curriculum. It was not a grant for course construction and so had no provisions for the customary troupe of outside experts visiting in summer workshops to instruct the faculty. The cluster groups (subsidized by FIPSE at the rate of $30 an hour for ten hours a semester) in fact did create miniature CORES of five to nine courses in the humanities and social sciences for offering in the second year of the grant to junior engineering majors. They were to choose three courses from one cluster to be taken in their last four semesters. In that same year four other clusters formed, creating a total of eight. The plan envisaged expanding the audience for the clusters to other professional-college majors in the Fall of 1994. As a result in the last year of the grant, four more liberal arts clusters evolved. A parallel development of science clusters for liberal and fine arts students began in 1993. Three of these were in place by the Spring of 1994. In theory, then, all the undergraduates on campus would be served. Thus, the curriculum innovation part of the project succeeded; as will be explained below, problems in delivering the courses to the students developed. The problems do not and did not hinge on the merits or efficacy of the project

B. PURPOSE

Professional curricula like Engineering can include the breadth and depth in the humanities and social sciences that both accrediting agencies like *Accreditation Board for Engineering and Technology* (hereafter *ABET*) and sound educational theory require if

the general education program is organized into lower and upper divisions distributed over four years. Then during the last two years, small clusters of upper level courses built around agreed-upon themes and requirements can offer students some elective choice while providing coherence among the courses. Thus an institution can develop an alternative to both restrictive, required CORES and loose area-distribution curricula. Furthermore, by involving them in the planning, construction, implementation and governance of the clusters, faculty from outside professional disciplines, will be engaged in the curriculum instead of being only employed in it. Much the same outcomes could result, I thought, from the same method applied to the creation of science clusters for liberal and fine arts students.

In the twenty years before I became dean, I participated in two reforms of general education, both of which failed. They were the products of representative committees that while encompassing all interests had a small membership. The product in each case was a philosophical statement reinforced by guidelines to be implemented by other small faculty oversight committees. The results were unpopular. A cynical attitude developed. The general education philosophy was regarded as tantamount to a series of prejudices, compromises, or adaptations to accreditation requirements of a variety of professional organizations. Many faculty members criticized the new curricula as arbitrary impositions that interfered with customary classroom activity. General Education remained synonymous with service courses, the onerous, FTE producers which subsidized the major programs. The result ill-suits professional programs, like engineering, which depend on general education for the course work that rounds out and leavens the intensive technical training their students must have.

For any new general education reform to succeed, faculty have to be induced to commit themselves to the goal that general education will become as important as any other part of the curriculum. It seemed to me, therefore, that the participating, individual faculty members had to construct the new general education curriculum in order for it to succeed.

They had to provide the guiding philosophy for a true CORE. Therefore, I sought a mechanism which would transfer responsibility for these tasks from an oversight committee to faculty participating in the new CORE. The cluster-group, which was modeled loosely on the small development teams that had success in local High-Tech companies, became that mechanism. Even now at the end of the project it is clear that the strategy was correct.

C. BACKGROUND AND ORIGINS

The University of Massachusetts Lowell is a technologically oriented multi-purpose university that was created by the merger in 1975 of a State College and a Technological Institution with two main campuses a mile apart. The student body of the new University of Lowell in its first twelve years grew to almost ten thousand undergraduates, double the size of the original institutions at the time of the merger.(Lowell was absorbed into an enlarged University of Massachusetts system in 1991). The campus is located in an old industrial city where in the pre-Civil War decades of the nineteenth century integrated manufacturing in textiles developed to new levels of size and organization. Lowell Technological Institute originally founded in 1894 as a textile school began with a mission of service to industry. That mission has not changed despite the institute's merger with what had been originally a normal school. This is reflected in priorities assigned by the administration to academic programs. Until the recent depression that followed the stock market crash of 1987, the Engineering College was the undergraduate flagship. It had the largest enrollment, the biggest faculty and received resources proportionate to its perceived centrality to the institution. As a result approval by ABET has to a certain extent driven curricular change.

In the mid-eighties the campus restructured its CORE. Feeling insulated by Lowell's special mission, confident that the high-tech snowball would keep rolling,

campus planners assumed that for the next decade its student body would begin their studies at Lowell as freshmen. The planners did not expect transfer students to be a large part of the student body. The faculty committee therefore designed the new CORE to stretch across four years of a student's career bringing engineers and scientists into upper level liberal arts courses and students in non-professional programs into sophisticated science courses in their junior and senior years.

The four year CORE required the creation of new courses at all levels. In the humanities and social sciences these would replace for students in most professional programs the staple disciplinary survey in sociology or history or psychology in the freshman and sophomore years. This foundation would lead to a three course upper level cluster of related courses. A student not already in a program requiring a heavy load of science and mathematics (e.g. a Fine Arts or Liberal Arts student) would take one year of mathematics and two semesters of interdisciplinary sciences as an underclassman. In the junior and senior years this base would be capped by a three course upper level science cluster.

As it happened *ABET* in its revised standards for 1986-1987 issued a call for breadth and depth in the humanities and social sciences. Under the impact of a visiting team's criticisms, this was interpreted at Lowell to mean liberal arts CORE courses must reach across all four years of the engineering curriculum and have an appropriate mix of introductory and advanced level courses. Here seemed to be a nice match with the evolving campus CORE philosophy. There was one problem: the lack of an implementation plan.

As Liberal Arts dean at the time, I was dissatisfied with a general education curriculum for professional programs that treated humanities and social sciences as an after-thought at best and an onerous irrelevancy at worst. I welcomed the new ABET standards as a lever to pry open the curriculum and insert some coherence into it. My opportunity to channel change came in the Fall of 1987. From a conference at Baltimore sponsored by the Association of American Colleges and ABET, I brought back the idea of clustering courses

which I modified and adapted to the situation at Lowell. It became the basis of the proposal to FIPSE. From the start I had the full support of the Dean of Engineering, Aldo Crugnola, and his Assistant Dean, Louis Petrovik. It was unwavering and invaluable. More remote support came from the President (now Chancellor), William T. Hogan, and the Academic Vice President, Robert J. Foy. That too was consistent.

Even as I submitted the proposal to FIPSE, structural changes within the Massachusetts economy and in the nature of the student body began to affect development of the new CORE curriculum. As early as 1987 the state's share of the cost of the institution began its sharp decline. Lower annual budgets followed by the use of a nasty little financial device called a recission, basically a middle of the year budget cut after all commitments had been made, undermined the financial base of the campus. Only raises in tuition and fees staved off a massive reduction in the size of the institution and its course offerings. But this palliative was risky. Lowell's traditional student body was working and lower to middle, middle class. These sectors of society were rocked by the depression. A student body used to working its way through college and culturally averse to long-term borrowing for such things as education found that Lowell was no longer a bargain. First with the failure of the Wang Computer Labs, then the decline of Digital Equipment Corporation, coinciding with the end of the Cold War and consequent contraction of defense spending which affected such giants as Raytheon Corporation, the local economy nearly collapsed. The high-tech snowball stopped rolling and the hopes of future electrical engineers and computer scientists melted. Lowell's most highly reputed programs suffered a dearth of students -- perhaps a consequence of depending on a student base committed to professional training rather than a traditional education. The engineering college, along with the equally favored management school, suffered huge declines in enrollment.

The crisis in enrollment led to a reassessment of the sources of future students. By 1994 transfer students made up over forty per cent of the student body. Almost imperceptibly outside influences made the four-year CORE a market hindrance. Transfer

students to management and engineering did not want to hear that they would have to fulfill general education courses that they believed they had finished when they earned their Associate's degree. Coupled with Lowell's high cost relative to other public colleges, this perceived intransigence about transfer credits served to discourage many potential new students. At the end of the Spring semester of 1994 a new general education curriculum generated by a worried administration replaced the CORE of 1987-88. It was now much easier to transfer into Lowell, but the distinctive four-year CORE was shelved.

It had been intended that the humanities and social sciences clusters serve management, health and science students as well as engineers. There were always certain problems with this scheme. The health curricula, notably nursing, expend much of their last two years on practicum experience. How their students, on campus only late in the afternoon, could fit the schedules of other majors was a vexing organizational problem, unsolved by the Spring of 1994. Accreditation requirements, hospital and other site schedules got precedence over general education theory. The school of management deans argued that the cluster requirement hurt their college the most in the Darwinian competition for transfer students. In a major curriculum crisis in May of 1994 which led to the new general education requirements, the College of Management withdrew from the four-year CORE. The Dean of Arts and Sciences, who only a few months before, had agreed to require that liberal arts students take a humanities and social sciences cluster in addition to a science one, followed suit. The CORE was in a shambles. Only the Dean of Engineering held fast. Clusters were still in place for his college's students. Every ABET accrediting team had praised the program as innovative and a good model for similar sized schools. As I write this, the cluster project is still viable because the chancellor supports it, the faculty involved are uncommonly loyal to it and the college of engineering retains it for its students (see the evaluation below)

D. PROJECT DESCRIPTION

In 1989 I proposed to the FIPSE that the cluster idea could be refined in the direction of curricular coherence. As a result the University of Massachusetts at Lowell received a three year grant from FIPSE to test a new approach to general education. The initial targeted students were engineers, but the clusters were to have campus wide application as the new CORE was implemented. This explains why twelve liberal arts clusters were rushed to development in the three years of the grant.

I recruited the first four cluster leaders from faculty with some experience running interdisciplinary programs. We agreed that a reputation for good teaching linked to interest in the cluster topics would guide recruitment of the remaining four to seven members of each group.

FIPSE subsidized the modest cost of setting up in the first year four cluster-groups which met during the course of one academic year for about ten hours of discussions a semester. The charge of the cluster-groups was to plan a small assemblage of upper level courses that cut across disciplines in the social sciences and humanities and revolved around a common theme. The faculty picked the theme. The result was a series of miniature CORES with common course requirements that were tied together by theme, as well as by expectations for student performance and goals.

The cluster-group was to continue to function after the planning stage finished. This is a necessary feature of the operation of this CORE curriculum. Because of the carefully worked-out cluster philosophy and the commitment of individual faculty members to its dictates, the cluster courses are not generic. They are unique to the teacher. Should a faculty member withdraw from the cluster for any reason, the course goes too. If anybody could teach any cluster course without going through the long period of discussions and consensus-building which created the clusters, then the whole purpose of the reform would be defeated. The coherence of the curriculum is the product of the cluster-group's consensus. Further, by being self-governing the cluster-group can use peer pressure to do better the job of policing the CORE to eliminate "powder puff " courses, those temptations

to students looking for the easy "A," than a distant oversight committee could. All cluster courses are intended to be equally demanding.

Two types of cluster evolved.The first typified, for example, by one entitled Technology and Human Values, put together a group of courses that focused on the issues of values and choice facing people making decisions in a High-Tech world. A second type, oriented to cultural studies, is represented by the cluster entitled Community and Diversity in America. Having its origins in the field of American Studies, this cluster, while built from a variety of courses, attains its coherence by emphasizing the common theme of the title. These were to be the prototypes of clusters to be offered to all students as the new CORE was implemented.

One important feature of the cluster idea was that the courses had to be different from any designed to be taken by students in the humanities and social sciences majors. They had to be true general education courses which meant that each had explicitly to introduce the student into the mode of thought specific to the discipline (e.g., history, psychology) and have applicability to the world beyond the classroom (e.g., the encouragement of lifelong learning, or, the explication and interpretation of problems of values and choice). At the very least existing courses would require redesign.

Since so many disciplines crossed in the clusters, faculty faced the difficult question of prerequisites. If the cluster used three of the minimum six humanities and social sciences courses required in any given professional curriculum, there was no room for a series of introductory prerequisite courses. It became clear that students would have to acquire any specialized vocabulary or guiding ideas specific to a discipline in the first few weeks of a cluster course.

In the first two years of the effort, eight clusters took shape. Always the balance sought was between student choice and curricular coherence. Since the first four clusters were developed for engineering students, faculty emphasized themes that they thought would appeal to majors in technical-professional programs. There was, however, objection

to this approach on the part of humanities faculty, who argued that engineering students needed a CORE experience that was not immediately applicable to their professional life. Where else in their curriculum would they deal with the traditional cultural heritage? One faculty-group produced the heavily culture-centered Judeo-Christian and Pagan Influence in Western Art and Thought. Since it is the least popular cluster developed so far, it remains to be seen how this debate will play out.

Certain restrictions governed the clusters. Students could not take more than one course from a particular teacher, nor preferably from a single discipline. Wherever possible the issues of values and choice crucial to a student's understanding of the wider implications of his profession, as well as those vexing topics that ignite disputes on campus about political correctness, were integrated into the courses.

As the cluster group discussions began, certain problems surfaced which the cluster leaders attempted to solve. Only when something which threatened to bring the project to a standstill arose, did they call on me in my dual role as project director and dean of the college to resolve things. Interestingly my ability to say: "FIPSE requires thus and so," carried more weight than any other single thing. Any implication that funding might be adversely affected by faculty recalcitrance brought about cooperation. I've asked myself why this should be the case. I conclude: liberal arts faculty get few grants at this institution. On the other hand "grant-getting" has high prestige on a technological campus. Put simply, FIPSE's confidence in our project was a source of great pride for all the faculty involved. I sense that Dr. Sherrin Marshall, FIPSE Project Officer, picked this up on her site visit.

The cluster idea, which tries to combine a modicum of student choice with curricular coherence, required that faculty and colleges sacrifice some of their control over schedules. By long tradition at Lowell, schedules are not the province of central administration. In the case of the professional programs, they are controlled by the departments, and in the case of liberal arts by the faculty in consultation with chairpersons. But in order to guarantee that students could have access to the needed courses so that they

could graduate on time, concessions on schedules had to be made on both sides. I proposed to the cluster faculty that they place all of their courses into two seventy-five minute blocks running on Tuesday and Thursday mornings. Then I asked the engineering departments to clear this part of the schedule of all junior and senior level engineering courses. Only cluster courses would be permitted in these blocks of time. Humanities and social sciences departments could then plan their cluster offerings for a two-year, four-semester span. Barring the uncontrollable effects of illness, death, sabbaticals, termination's and leaves, students could know that faculty were committed to teach the courses that they elected out of the clusters. The solution seemed elegant. I was mistaken. Cluster faculty did not see why they had to change their customary schedules. Engineering departments claimed these time slots were the only convenient ones available for laboratories. I negotiated with both sides; I called on the Dean of Engineering for help. We worked together on the problem. We got nowhere. I went to the chancellor and explained the problem. He intervened, ordering the engineering departments to clear their schedules. With this backing from the chancellor in hand I prevailed with the cluster faculty--temporarily as will be shown. Here was one of the few times when persuasion had to yield to power in the implementation of the grant.

Discussions began with the faculty in the sciences about their clusters in the second year of the grant. From the start there were difficulties. The hierarchical nature of the sciences created in the faculty a mind-set that derived upper level courses from lower level prerequisites. A true junior level course in Physics, for example, even for liberal arts students not only presupposed Calculus but also at least one full year's introductory course in the discipline. Most of the science faculty thus would see the cluster as a kind of three course miniature minor in a single discipline. This was never the philosophy of the authors of the 1987-88 CORE on which my FIPSE proposal was based. I was shocked to find that not many on the research/graduate studies oriented science faculty had absorbed the implications of the new CORE. This was my first presentiment of what was ahead.

I consulted my project officer about this developing obstacle to implementation. She agreed that I could try a strategy that included forming a group of scientists willing to explore the creation of an *Introduction to Science* course that would be prerequisite to a science cluster. The aim here was to convince a vanguard of faculty that there might be imaginative approaches to teaching science to laymen that were untraditional, i.e. not totally content bound.

That June, for about three weeks, two physicists, a chemist, a geologist and a biologist sat with a philosopher, a professor of literature and myself, an historian, with an amateur's interest in science, to talk out what this introductory course might be like. My idea was that we three laymen could guide the scientists about what approaches made sense to us and would by some measure of extension make sense to liberal arts students. The experience was frustrating. I first suggested an historical approach. Start as Copernicus and Galileo did with Physics and Astronomy and work up to the sophisticated cross-disciplinary sciences of today. The science faculty at first were amenable, but then as discussion continued, rejected the approach as unworkable for them. They did not know the history. So it went with other suggestions. In the second summer of discussions they worked out a course that suited them. To me it looks like a scientific equivalent of Western CIv I -- a little bit of everything.

The science clusters themselves have some interesting courses in them. Each cluster, however, has an advanced mathematics course that I predict will never succeed in drawing students. Math phobia is epidemic in our Fine Arts, Humanities and Social Sciences students.

The cluster groups in science worked differently from those in the liberal arts. The leaders told me frankly that the course developers might not necessarily, even probably would not, teach the courses. When I objected that this was against the philosophy of the grant, they were indifferent. FIPSE clout did not carry the weight here that it did in the liberal arts cluster groups. Also by this time, the full merger that created the College of Arts

and Sciences, was completed by the hiring of a new dean to preside over the whole thing. I had lost the prestige of the co-dean's position that I had shared for two years with a colleague from the sciences. I could not count on the new dean for support.

Faced with the scientists "we know best how to do this" attitude, with the indifference of the new dean and a nagging conviction that the science faculty's commitment at best was tepid, I ceased my interventionist approach and returned to the method of "laissez faire" which had produced by the end of the project twelve liberal arts clusters. Three science clusters did emerge from the science faculty's discussions.

E. EVALUATION/PROJECT RESULTS

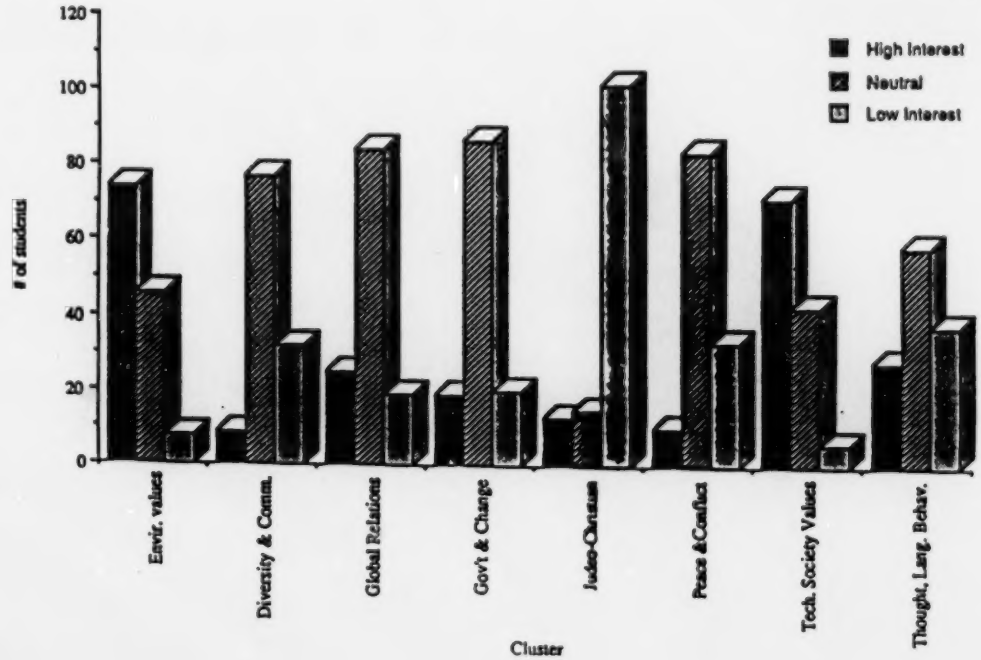
Three evaluations of the project have been done (see appendix). One was the result of a doctor of education dissertation and was done at my invitation. Jacqueline Moloney taped the planning sessions of the initial four cluster groups in the first year of the grant. They demonstrated what later became very clear about the cluster groups: the energy and ability of the group leaders were crucial to the group's success; and overall, the cluster group concept was an unexpectedly effective vehicle for faculty development (Moloney, 1994). It confirmed a feeling that I had for some years that *ad hoc* interdisciplinary faculty groups were far more effective organizations for academic innovation than departments. They were more flexible.

The formative evaluation (Hagedorn and Ackerman) built on Moloney's work and presented a picture of the state of the project after the initial run of courses had been offered to students. Their conclusions confirmed those of Moloney. They used a combination of questionnaire and interview to reach their findings (see Appendix). Already at the time of their reporting the major successes of the project were apparent, as was at least one of its defects.

The third evaluation (Civian and Stassen) was done in the Fall of 1994, after the grant with its one year no-cost extension had finished. The successes listed by the evaluators are real and continuing; they fulfill the original objectives of the grant: 1.

Expanding the perspectives of students in professional programs; 2. Emphasizing writing; 3. Emphasizing discussion; 4. Making the courses truly upper level; 5. Involving faculty in an enthusiastic way in general education; 6. Meeting the demands of accrediting agencies in a responsible way.

In regard to expanding the perspectives of students in professional programs, I have some reservations about the success of the initial clusters. At the point in the Spring of 1993 when eight clusters would become available to engineering majors the following September, with the cooperation of the departments of the college I surveyed their sophomore students to see which clusters appealed to them. As can be seen in the following graph, the clusters which dealt one way or another with technology or economics were by far the most favored. While the courses in these clusters can raise important questions of values and choice, students avoided a true broadening of perspective by not opting for the more humanistic clusters.



Cluster Preference Survey Results.

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In turn this survey became the basis on which my successor as Dean of Arts and Sciences, Hamid Shirvani, negotiated an agreement with the Dean of Engineering to name four clusters only as the ones open to election by engineers. He came at the problem from a resource position with which I partly sympathized, but the decision hamstrung the other clusters.

There is one caveat about this third evaluation: it was intended to be summative. But the two evaluators expressed the opinion that the project was still evolving and that a summative evaluation was still not appropriate (see Appendix). To an extent I understand why they take this position. There are some serious challenges that they list, and I want to respond to three.

Continuing activity of the cluster groups: Some of the cluster groups are more vital than others -- meeting regularly as self-regulating units after the end of the grant. Where there is lassitude or default, to an extent this can be traced to the energy and commitment of the cluster leaders. It is they who must schedule the ongoing meetings after the cluster begins functioning. It is they who must take the responsibility to see that student evaluation is ongoing and that sufficient numbers of courses a semester are available each year. These are not paid positions and no course reduction is attached to them. The cluster leader must obtain gratification from the success of the group. There is no authority over the leaders other than peer pressure. The project director's limited power and authority terminated with the grant. In any case the project fails in one of its most important premises if an administrator has to oversee the groups.

Course Availability --problems with scheduling, number of course offerings and location. Some students find that they can get two of their three courses in a cluster, but the third one, the evaluators found in talking to faculty and students, can be elusive. In theory students should have an easy time getting all three since they have four semesters to fill the requirement. The evaluators' conclusion from their analysis of offerings over a period of semesters is that not enough courses are being offered in the

clusters. Yet I suspect that the problem is more complex. Despite hopes to the contrary, students avoid certain teachers with the repercussion that a string of unfilled, therefore canceled sections, over a period of several semesters discourages the faculty member from continuing to offer courses. The market speaks, but when a cluster group is as small as these were all intended to be, the practical removal of one member indeed reduces course offerings, and therefore choice. Students would confront a distribution of offerings that places courses accessible to them in inconvenient semesters, and when they can take a course, they face ones they've already elected. Furthermore, some faculty members respond to student demand by enlarging their sections beyond the agreed upon thirty. They are popular teachers, but their actions have the negative effect of reducing the student pool to a point where the unfilled sections in a cluster cannot reach an economical size and are canceled by the dean. A group of students then complain that the cluster offerings are too limited, and that they must be given waivers in order to graduate on time. My solution to this problem is to combine related clusters so that the course offerings are larger, and choice and availability expanded. I see little hope of solving the problem by putting courses into winter intersession or summer school (as suggested by Civian and Stassen), both of which are enrollment driven.

Conflict within the faculty over scheduling on levels both of practicality and principle have interfered with the smooth working of the program. My plan to schedule in assigned blocks keeps breaking down. Faculty unwilling to teach on the other campus, or unwilling to change habitual teaching days, or conform to the necessary class length of seventy-five minutes, undermine the program's success. Frankly I have no authority now that I am no longer dean to enforce the scheduling compromise (see above). In addition the engineering departments have been surreptitiously reclaiming the demarcated blocks for their laboratories. Dean Crugnola of Engineering, when he is informed of the encroachments, will intervene. Schedules, however, no longer pass through me until they are in proof for the printer. By that time it is too late to force changes.

Helping Students Achieve Interdisciplinary Thinking. This is another "challenge" observed by the evaluators that deserves response. They concluded that students miss the interdisciplinary intent of the cluster idea because faculty make too little effort to convey it in courses. Students are therefore left to draw conclusions, make connections and integrate material by themselves. At the beginning of the project this question came up for debate in all clusters. It began with demands for prerequisite courses, but there was no room in the curriculum for them. Each course would have to introduce the student to questions asked in the discipline and show how its practitioners thought. I argued that the project was less interdisciplinary than cross disciplinary, each course standing by itself but tied to the theme of the cluster. I had in fact proposed to FIPSE that the aim would be to encourage the student to do the integrating and synthesizing, albeit with explicit guidance from the faculty. Clearly, this worked less well than I had hoped (see the *Student's Guide* in the appendix, where what I had intended is made explicit). We will try to implement the recommendations of the evaluators on this issue.

When I wrote the enclosed article for the *Journal of Engineering Education*, I thought the advising piece of project was solved. The teams of co-advisors outlined there have never come to fruition. Perhaps, the answer to the challenge that the evaluators see in regard to advising can be solved if in the next year I can get the plan into action. To my mind it is important to get the Engineering faculty to commit to the project which they say publicly is an excellent undertaking, but, which anecdotal evidence that both the evaluators and I have heard, they dismiss or at best treat as a necessary evil.

The project has already had some dissemination. In June of 1991, Dean Crugnola outlined the approach to the clusters in a well-received presentation given to the American Society for Engineering Education at its annual meeting in New Orleans. I published a summary article "Introducing Breadth and Depth in the Humanities and Social Sciences into an Engineering Student's General Education Curriculum" in *Journal of Engineering Education*, Vol. 82, No. 3, July 1993, 175-180. The results of the first evaluation of the

faculty development part of the project appeared in Jacqueline Moloney, "Elements and Issues in Planning Cross-Disciplinary Clusters from a Faculty Perspective," *The Journal of General Education*, 43, No. 2, April 1994, 73-89. Evaluators Stassen and Civian suggested that the project had enough merit and success to justify applying for a FIPSE dissemination grant. I shall do this when I am satisfied that "the challenges" they list in their report have been surmounted.

F. SUMMARY AND CONCLUSIONS

As a faculty development scheme the project succeeded admirably. Cluster faculty in the Humanities and Social Sciences are deeply connected to the program. The concept of the cluster groups worked well in formulating the questions and the common themes as the faculty organized themselves. The energy and commitment of the cluster leaders often determined the success, coherence and continuation of the group.

Evidence from student evaluations and student interviews indicates a high level of satisfaction with clusters favored by engineering students. Coherence in the curriculum as a goal may need strengthening, but the objectives of improving writing and discussion skills while broadening students points of view have been met.

As to the science education part of this project: I am not sure that what FIPSE wanted -- upper level science courses for non-scientists -- is a practical objective. The cluster courses that resulted, unlike the ones in the Humanities and Social Sciences, are upper level courses only by virtue of a narrowing in some of them of the topic studied and the assignment of a 300 number. The teachers would cheerfully admit this. I tend to agree with them that calling the courses upper-level does not make them so. The problem is the students' lack of rigorous preparation. My solution is to abandon the pretense, assign 200 level numbers to the cluster courses and offer them as part of the three course science requirement.

I found as project director that I could be defeated by passive resistance even when backed by my authority as dean during the years that I held the post. For example, each

cluster group was charged with developing its own instrument for student evaluation. Some did so. Some members of the groups administered them. Others did not. Some groups left the construction of the instrument to each faculty member -- over my objections. Other groups failed to agree on what the common instrument should look like. Even my best cluster leaders failed me and the project on this. A very important part of the evaluation scheme broke down. My original idea based on the assumption that the cluster groups would evolve unique approaches to the material and therefore could best design the student evaluation instrument was unfounded. I now think that I should have paid an outside consultant to produce one for the whole project. There is on this campus a entrenched culture opposed to student evaluation of courses. Faculty passive resistance concerning scheduling has also been difficult to break down.

What would I do differently? I would broaden the clusters. My original submission to FIPSE featured clusters of as many as thirty different courses. My conversations with Sherrin Marshall, then my contact at FIPSE, who echoed criticisms of the readers, convinced me that these large groupings were unwieldy and incapable of providing the vehicle for faculty involvement in curriculum reform that was at the heart of my proposal. As a result I went too far in the other direction. Many of the clusters are too small. There does, however, seem to be a manageable, even optimal, number of faculty who can work efficiently together as a cluster group. Beyond twelve we have a cluster crowd rather than group.

In a project based on faculty self-directedness problems for a project director do arise. There were clusters proposed that I recognized would have no market among the original audience of engineering students. I tried, for example, to discourage the women's studies group from putting together a Gender Studies Cluster until other majors in other colleges would be available to elect it. The women's studies group insisted that as a matter of principle that they try. Their original offerings drew insufficient students to justify running the courses. I suspect that a similar thing happened with the American Studies

cluster with the word "diversity" in its title. It could not attract students, when it should have been a natural draw. An issue in both of these examples may be the attitude of part of the Engineering Faculty some of whom openly scoffed in a public meeting at "women's courses." As advisors they do not do much to broaden the culture. The fact that certain fields like engineering need to confront exactly these topics is hard to deal with when some measure of student choice in course electives is an important aim. People cannot be forced to be free in this context.

APPENDICES

1. Information for FIPSE
2. Peter Blewett, "Introducing Breadth and Depth in the Humanities and Social Sciences into an Engineering Student's General Education Curriculum" in *Journal of Engineering Education*, Vol. 82, No. 3, July 1993, 175-180.
3. Jacqueline Moloney, "Elements and Issues in Planning Cross-Disciplinary Clusters from a Faculty Perspective," *The Journal of General Education*, 43, No. 2, April 1994, 73-89.
4. Peter Blewett, *A Student's Giude to CORE Clusters*, Lowell, 1991. An advising pamphlet produced to publicize the first four clusters.
5. Estelle Hagedorn and Richard Ackerman, "CORE Cluster Program, University bof Massachusetts Lowell, Formative Evaluation Report of Process 1992"
6. University of Massachusetts Lowell, Schedule of Classes, First Semester 1994-95. In the center yellow pages is a listing of all twelve humanities and social sciences clusters.
7. Video propared by university audio-visual staff designed to orient incoming students to the idea of clusters. In part it is a visualization of Appendix 4 above.

APPENDIX 1: Information for FIPSE

1. I have nothing but praise for my two program officers, Sherrin Marshall and Joan Straumanis. I worked with Sherrin Marshall for what amounts to two and half years from the time her encouragement helped me to rework my original proposal to make it more pointed and presumably worth funding. Her site visit in the Spring of the first year gave the project a great boost in prestige and her support in a meeting with University President William T. Hogan did more than I could to validate the work going on in curriculum innovation right there on his campus. I was sorry to lose her support and guidance when she left FIPSE to go to FIRST, but I was handed over to the very capable and equally supportive Joan Straumanis. At her suggestion I joined two other project directors in a presentation on curriculum development as a tool for faculty development at the 1993 FIPSE annual meeting. Joan Straumanis had intended a site visit for the last funded year of the grant, which she was unable to make.The visit would -- in retrospect -- have been valuable to the project because at the time I was struggling with the science faculty over both their clusters and an introductory course. Being a philosopher of science and having taught a science course for non-science students, her input would have carried great weight. Enough to get them to change their opinions -- I would say prejudices? I don't

know. The discussions would have been spirited. Travel funds allowing, two site visits during a three year grant period might be a valuable practice for FIPSE to institutionalize.

I am a historian by trade and a professional educator only by virtue of thirty years in the class room. There is one whole area to which my expertise does not extend: assessment and evaluation. What I originally proposed to FIPSE as the evaluation part of my project turned out to be overly ambitious. One feature, intensive monitoring of students through the three courses in the cluster, featuring end-of-course and cluster exit-interviews, was too labor intensive for the resources available and the faculty culture I was trying to change. Lowell is not Alverno. I would have benefitted from mandatory sessions on assessment and evaluation at the FIPSE annual meeting. An afternoon or two working in a group led perhaps by Dora Marcus would have benefitted me greatly. My interview with her came so early in the life of the project that I had no conception of what questions to ask to take advantage of her expertise.

2. If FIPSE continues to sponsor the kind of project that I did, I would still pursue both the cross disciplinary aspect and the attempt to break through the barriers between science and the humanities. I did not have a lot of success with the science faculty at Lowell. (At the time, 1989, FIPSE was seeking alternatives to "Physics for Poets" courses). My sense is that the science faculty did not believe that the goal of creating true upper level science courses for non-scientists was reachable. As I have said in the report, I now agree with them. Nonetheless, better science courses for non-scientists should be attainable, even though they are not upper level. Some of our discussions in pursuit of an introductory science course touched on such topics as moral responsibility of scientists, public perceptions of science, the citizen's role in policy decisions regarding science and technology, the misunderstanding of the scientific method and the red herring of logical positivism. We agreed that an educated layman should face these questions in dialogue with a scientist. Yet when it came to devising syllabi, traditional content overrode these questions. My opinion based on this experience is that science faculty have in general one paradigm for teaching their subjects. All courses are versions, perhaps watered down, of the ones designed to train future scientists. A set body of knowledge must be covered. Furthermore the laboratory experience is requisite to every course. I would argue that FIPSE should encourage science faculties to change this paradigm. It would better serve the layman who among other things can rarely have a true laboratory experience -- as the scientists themselves will admit on occasion.

3. Finally, one other comment. When I became project director, I had been an acting dean of Liberal Arts and was in 1990 co-dean of a newly created Arts and Sciences College. In the summer of 1991 the upper administration chose to go outside the institution

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for a single dean to replace the co-deans. This took me by surprise. I had understood, mistakenly as it turned out, that the search for an Arts and Sciences dean which had had two previous failures was suspended for the forseable future. I would not have undertaken the FIPSE project with the prospect of losing the dean's authority before it was completed. I have two reasons: (1) if I had begun the project as a faculty member not a dean, I would have handled some of the interpersonal relations differently. I could cut through problems on occasion as a dean to which I would have had to have sought other solutions as a faculty member. This gave the project a certain tone that I was forced to change in the last year of funding and during the no-cost extension. (2) There was no guarantee that my successor as dean would either approve or support the project. As it turned out he did not. This caused considerable friction.

Sherrin Marshall once told me that FIPSE gave comparatively few grants to administrators as project directors. FIPSE preferred to seek change working mostly through the faculty. My experience suggests that this is a sound practice. Had I still been co-dean my relations with the science faculty might have been different. For one thing I could have called on my colleague for support at crucial points. In retrospect I think the grantee needs, if that person is a dean, security of tenure for the life of the grant. Otherwise the project director should be a faculty member from the start -- at least for the type of project I had proposed.